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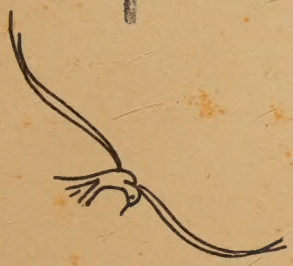

INDIAN FISHERIES BULLETIN

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INDIAN FISHERIES BULLETIN

VOLUME VII, NO. 1

JANUARY, 1960

Issued by

GOVERNMENT OF INDIA
MINISTRY OF FOOD AND AGRICULTURE
(Department of Agriculture)

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INDIAN

GENERAL AND DEVELOPMENT

Recommendations made at the First Meeting of the Central Board of Fisheries held at New Delhi on 29th December, 1959.

The first meeting of the Central Board of Fisheries which has been set up by the Government of India to consider at national level of problems connected with the various aspects of fisheries research and development, to discuss ways and means for implementing the programmes of development and research on fisheries and recommend suitable measures for adoption to effect better coordination of fishery activities between the Centre, States and various other organisations, was held in New Delhi on the 29th December, 1959. The meeting which was presided over by Shri S. K. Patil, Union Minister of Food & Agriculture considered the important problems of fisheries development and proposals for increased production of fish and fishery products during the Third Plan, the projects for training fisheries personnel, fish seed supply for cultural purposes, the recommendations of the Fisheries Enquiry Committee on rules and regulations applicable to motorised fishing vessels, export promotion of fish and fisheries products and establishment of Directorates of Fisheries in the States. The following resolutions were adopted by the Board :—

I. Approach to Fisheries schemes in the Third Plan

"The Board approves the fisheries development and research programmes of the Central and State Governments for the Third Five Year Plan and recommends that immediate steps be taken by the Central and State Governments for implementing the suggestions made in the draft plans. The Board in this connection emphasises the need for effective coordination with other Ministries concerned.

The Board also recommends adequate provision of financial assistance to fishermen, Cooperatives, fishing industry and trade."

II. Projects for Training Fisheries Personnel

Having considered the increasing need for technical personnel in the Third Five Year Plan and successive Plans, the Central Board of Fisheries welcomes the proposals for the establishment of the Central Institute of Fisheries Education and recommends that full advantage of the training facilities provided at this Institute and other training centres organised by the Central and State Governments should be taken by the State Fisheries Departments and fishing industry. The Board also recommends that immediate steps be taken for organising training fisheries operatives.

III. Fish Seed Supply for Cultural Purposes

"Considering the need for increased production of fish seed of suitable species for purpose of fish farming the Board recommends that the State

Departments of Fisheries should take immediate steps for conservation of brood fish, fish spawn and fry, and for organising more fish seed supply centres both from natural sources and by induced breeding methods. Construction of adequate number of nurseries should receive high priority".

IV. Consideration of the recommendations of the Fisheries Enquiry Committee on rules and regulations applicable to Motorised Fishing Vessels.

"The Central Board of Fisheries accepts the recommendations made by the Fisheries Enquiry Committee set up by the Ministry of Food & Agriculture in connection with rules and regulations applicable to motorised fishing vessels, and recommends that the State Governments and Central Ministries should take immediate steps in regard to the facilities for training, supply of mechanised boats and fishing requirements. The Ministry of Food & Agriculture should take up with the Ministry of Transport and Communications for providing through the various port authorities under them facilities for berthing and handling of power fishing vessels. Adequate credit facilities and relaxation of foreign exchange for marine diesel engines and fishing gear should be provided. The fishing vessels should be exempted from payment of duty on fuel oils and fishing twines."

V. Establishment of Directorates of Fisheries in the States

"In view of the increased allocations for fisheries development schemes in the Third Plan and emphasis given to the inland fisheries development schemes and also in view of the necessity for undivided attention to fisheries problems, the Central Board of Fisheries recommends that separate Directorates or Departments of Fisheries under Fisheries Technical Officers may be established."

VI. Export promotion of fish and fishery products

"In order to promote the export trade of fish and fisheries products, the Central Board of Fisheries recommends that designs should be developed for suitable fishing vessels and that increased facilities be provided for import of fishing gear and vessels, components of ice, cold storage, freezing and canning plants and packing materials. The Customs Authorities should give high priority for clearance of frozen fish products and advantageous freight rates should be secured for shipment of fishery products from India. The grant of rebate of import duty on packing material etc. imported for export should be expedited, and wherever drawback rules are not in existence, they should be framed immediately. The rules prescribed by the Export Promotion Directorate may be relaxed to enable the fish processers to handle a part of the catches for internal consumption also in order to enable them to keep their plants in commission for longer periods. For maintaining high quality of export products it is necessary to institute strict quality control of the products and to set up analytical laboratories in important ports for the issue of quality certificates on a uniform basis. To develop the export of more fish and fishery products the Indian Embassies and Consulates abroad should be requested to take positive measures to make these products more popular and try to include them in the trade agreements.

The Central Board recommends that in the interest of export promotion State Governments do not impose and in cases where they exist withdraw, sales and purchase taxes etc. and also that the export cess on

prawns should be kept in abeyance until such time as the industry is firmly established. The Board also recommends that suitable subsidies should be granted for diesel oil, net material, cans, packing material and the oil used in canning so that our frozen and canned products could be sold at competitive prices abroad."

Marine

(i) *Oil Sardine Fishery*

The Oil Sardine (*Sardinella longiceps*) fishery along the West Coast of India, usually confined to the coast line of Mysore and Kerala States, was fairly good during the quarter ending December, 1959. At Calicut which may be considered as a representative centre for oil sardine landings on the West Coast, the catches for the period amounted to 941.6 m. tons, of which 539.7 m.tons were landed in October, 1959 and 290.46 m.tons in November and 111.45 m. tons in December. A notable feature was the occurrence of extensive shoals of oil sardine off Calicut during the month of October. In the northern zone Mangalore to Karwar, the oil sardine fishery was good only in November with either very poor or no landings at all during the rest of the months. In and around Calicut the fishery was best in October followed by a downward trend in November and December; whereas in the Southern zone extending along South Kerala, the oil sardine fishery was poor in October but has improved considerably during November and December.

The important types of gears which accounted for the highest catch-per-unit of effort of oil sardine in the different regions were Rampani (a large shore seine) and gill nets in the Northern zone and a boat seine in the Central zone. Fishing activity for oil sardine appeared to have been mostly confined to the inshore waters about 2-7 fathoms deep off Cochin and 4-8 fathoms off Calicut. This, however, does not rule out the possibility of sardine shoals occurring in the offshore regions which are not exploited at present for want of suitable craft and gear.

From the size composition of oil sardine occurring along the West coast during the quarter, it was apparent that in the Southern and Central zones there were two-year classes contributing to the fishery, the larger size group around an average size of 180 m.m. dominating the catches during October and the smaller size group with a model size around 135 m.m. during November and December. The occurrence of only the smaller size group and the complete absence of the larger size group in the northern zones were points of interest concerning the oil sardine fishery on the west coast as a whole.

Studies on the maturity of oil sardine indicated that during October and November the larger size groups were in stages V, VI and VII, whereas during the latter half of November and the whole of December almost all individuals were either in stage I or II. Majority of the landings appear to have been contributed by oil sardine in the latter group. Observations at Calicut on the feeding habits of oil sardine showed that Bacillariophycae formed the dominant food item during the earlier part of November whereas Dinophyceae predominated during the rest of the month. Besides these, Tintinnids were common while Copepods and Cypris were rarely noticed. Studies undertaken at Mangalore indicated that the items of diet in oil sardine included *Pleurosigma* spp., *Fragilaria oceanica, Coscinodiscus* sp, Biddulphia etc.

(Central Marine Fisheries Research Station, Mandapam)

(ii) *Mackerel Fishing on the West Coast during the quarter ending 31st December, 1959.*

The Mackerel *Rastrelliger kanagurta* fishery this year on the West Coast of India was poor during October-December which is usually the period of good mackerel catches along this coast. The fishery commenced on the Kanara Coast in the last week of October. At Karwar, a total of 837.1 m.tons was landed during the quarter, as against 1,441.9 m.tons during the fourth quarter of last year. At Ullal (Mangalore) the total estimated catches of the quarter amounted to only 9.1 m.tons of which 8.5 m.tons were caught in October only. At Calicut the total quarterly catch was 361.62 m.tons, the fishery in October, and November being better than in the corresponding months of 1957 and 1958; but there was a sudden set back or decline in December. The monthly landings for October and November were estimated as 79.2 and 73.4 m.tons respectively during 1957 and as 73.8 and 68.1 m.tons respectively in 1958 while during the current season, 180.2 m.tons and 152.1 m.tons of mackerel were landed in October and November respectively (these figures being higher than in the corresponding months of the previous two years). The December total catch at Calicut was only 29.3 m.tons. At Vizhingam, further South, the total landings of the quarter were 5.2 m.tons of which 3.5 and 1.6 m.tons respectively were landed during October and November.

The catches were made mainly with the rampan at Karwar and gill net at Ullal (Mangalore), the boat seine Ayilakolli Vala and Pattenkolli Vala and the gill net—Ayila Chala Vala at Calicut, the boat seines and shore seines at Vizhingam.

Intensive biological studies were continued at all the centres. The size of Mackerel ranged during the quarter from 130 m.m. to 250 m.m. at Karwar, 140 m.m. to 234 m.m. at Ullal (Mangalore) from 170 m.m. to 233 m.m. at Calicut and from 140 m.m. to 220 m.m. at Vizhingam. Studies on maturity stages revealed that at Karwar the adult Mackerel was in the spent condition till about the middle of November, the subsequent weeks showing samples only in maturity stage II. At Ullal (Mangalore) the samples were mostly in stages I and II. At Calicut they were in or near stage I throughout the quarter while at Vizhingam they were in stages I and II, excepting the single large specimen which was in a spent condition in December.

(Central Marine Fisheries Research Station, Mandapam Camp)

(*iii*) *Pearl and Chank Fisheries of Tuticorin (Madras State) for* 1954 *to* 1959.

Season	Quantity of Chanks fished			Rate per 1,000 full sized chanks	Rate per 1,000 under-sized and wormed
	Full sized	Under-sized	Wormed		
1954-55	3,46,680	28,305	9,964	1,576·00	111·00
1955-56	5,07,693	34,050	16,687	1,327·00 1,636·00	111·00
1956-57	6,60,892	35,145	27,407	1,576·00 1,661·00	111·00
1957-58	8,62,498	31,246	31,073	1,661·00	110·00
1958-59 .. .. .. upto 31-3-59	11,55,644	61,871	43,357		

Year	Total quantity of pearl Oysters fished	Gross revenue Rs. nP.	Value of pearls Rs. in lakhs
1955	35,08,967	1,46,123·88	5
1956	21,29,058	45,454·82	2
1957	1,11,75,214	1,68,807·31	5
1958	2,14,76,514	4,74,067·27	12·5
1959	1,64,28,298	8,73,001·26	25

(iv) *Pearl Banks of Madras.*

I. Pearl Banks lying off the coast of the Revenue District of Tirunelveli between 5 and 12 fathoms contours commencing from Vaippar Peria Par (Lat. 8° 54′ 45″ N. Long. 78° 16″ E) in the north to Palli Kulla Par (Lat. 8° 13′ 45″ N. Long. 77° 59° E) in the South and known by the following names :—

		Fathoms
1.	Vaippar Peria Par	6 to 7
2.	Vaippar Karai Par	6¼
3.	Devi Par	6 to 7¼
4.	Pernandu Par	6 to 6¼
5.	Padutta Maraican Par	6 to 6¼
6.	Padutta Tundu Par	6 to 6¼
7.	Tuticorin Kuda Par	7 to 7¼
8.	Cruxian Pár	5¾ to 6¾
9.	Crusian Tundu Par	6 to 6¼
10.	Vantivu Arupagam Par	5¼ to 6¾
11.	Nagarai Par	6¾ to 7
12.	Utti Par	7 to 7½
13	Uduruvi Par	7 to 8½
14.	Killatti Par	7¼
15.	Attuvai Arupagam Par	7
16.	Attombathu Par	7¾ to 9
17.	Pasi Par	8½ to 9
18.	Pattarai Par	7½ to 8½
19.	Kutadiar Par	8
20.	Vada Olipathu Par	9¾ to 10
21.	Tholayiram Par	8 to 11

22.	Vada Ombathu Par	8 to 8½
23.	Saith Ombathu Par	8 to 8½
24.	Pulli Pundu Par	8 to 9
25.	Kanna Pulli Pundu Par	8 to 9
26.	Alluva Par	6
27.	Kanna Tivu Arupagam Par	5¼ to 6
28.	Tundu Par	5½ to 6
29.	Nenjurichan Par	8
30.	Par Kudanjam Par	7¾ to 8¼
31.	Mela Ombathu Par	8¼ to 8½
32.	Pinnakayal Seltan Par	8¾
33.	Gandamaram Piditta Par	9 to 9½
34.	Irativu Kudamuttu Par	7½ to 8½
35.	Nadukudamuthu Par	7½ to 8½
36.	Kovilpidditta Pudu Par	9½ to 10
37.	Gankuraiya Pathu Par	10
38.	Nilamkallu Par	9 to 9½
39.	Sathu Kuraiya Pathu Par	10
40.	Rajavukku Sippi Sothicha Par	8 to 9
41.	Kudumutta Par	7½ to 8½
42.	Saithu Kudamuthu Par	7½ to 8½
43.	Naduvu Malai Pidditti Par	8 to 8½
44.	Periya Malai Piditta Par	8½ to 10
45.	Kadian Par	7 to 7½
46.	Kanava Par	7½ to 8
47.	Pudu Par	7½ to 8
48.	Karai Karuwal Par	8½
49.	Velangu Karuwal Par	8½
50.	Tundu Par	9 to 9½
51.	Trichandur Punthottam Par	7½ to 8½
52.	Odakarai Par	9 to 11
53.	Chodi Par	8 to 9
54.	Sandamacoil Piditta Par	8¼ to 9
55.	Teradi Pidditta Par	8¼ to 9
56.	Semman Pattu Par	8 to 9
57.	Surukku Ombadu Par	8¾

58.	Manappad Periya Par	$5\frac{3}{4}$ to 7
59.	Kallam Pulli Par	6 to $8\frac{1}{2}$
60.	Koil Pidditta Par	$6\frac{1}{4}$ to $7\frac{3}{4}$
61.	Pulli Kallu Par	7 to 10

II. Pearl Banks lying off the coast of the Revenue District of Ramanathapuram between $4\frac{1}{2}$ to 7 fathoms contours from Pamban Karai Par (Lat. 9° 10′ N. Long. 79° 20′ 15″ E) in the North to Vembar Karai Par (Lat. 9° N. Long. 78° 29′ 15″ E) in the South and known by the following names :—

		Fathoms
1.	Pambam Karai Par	$5\frac{1}{2}$ to 7
2.	Pamban Peria Par	$5\frac{1}{2}$ to 7
3.	Velangu Par	$4\frac{3}{4}$ to $7\frac{1}{2}$
4.	Musal Tivu Par	$4\frac{1}{2}$ to $7\frac{1}{4}$
5.	Cholava Karai Par	$4\frac{3}{4}$ to $6\frac{1}{2}$
6.	Kilakarai Vellai Malai Velangu Par	7 to 8
7.	Vellai Malai Karai Par	6 to 7
8.	Anna Par	$5\frac{1}{4}$ to 8
9.	Nallatanni Tivu Par	6 to $8\frac{1}{2}$
10.	Upputanni Tivu Par	6 to 8
11.	Kumulam Par	6 to 7
12.	Valinukam par	6 to $8\frac{1}{2}$
13.	Valinkam Tundu Par	5 to $7\frac{1}{2}$
14.	Vembar Peria Par	9 to $10\frac{1}{2}$
15.	Venda Karai Par	6

III. Pearl Banks lying off the Island of Rameswaram in the North between 5 and 7 fathoms contours and known by the following names and lying between 79° 23′ to 79° 30′ E Longitudes :

1.	Pasi Par	5 to 6
2.	Nadu Par	5 to 6
3.	Velangu Par	5 to 6
4.	Velangu Tundu Par	5 to 6
5.	Kannikai Par	5 to 6

IV. Pearl Banks lying off the West Coast of Palk Bay and known by the following names and lying between 79° 8′ and 79° 12′ E Longitudes :

1.	Tondi Pearl Banks	$5\frac{1}{2}$ to $5\frac{7}{8}$
2.	Karangadu Pearl Banks	$5\frac{1}{2}$ to $5\frac{7}{8}$

V. Pearl Banks lying off the coast of Palk Bay in the Tanjore District known by the following names :—

1. Pudupatnam Pearl Bank .. .. 2 to 4
2. Mallipatnam Pearl Bank .. .. 2 to 4

The Windopane Oyster Banks in Tuticorin Harbour in the District of Tirunelveli, Tuticorin Taluk are known by the following names :—

1. Silavathurai Kalam
2. Akkalam
3. Thalakalam
4. Karaoadukalam
5. Munthalakalam
6. Thottikalam
7. Karanji Tivu Kalam.

(v) *Trochus, Turbo and Nautilus shells of Andamans & Nicobar Islands.*

Trochus, Turbo and Nautilus shells are available in Andaman and Nicobar Waters in large numbers. The rights to fish shells from these waters are granted only on licences issued under the provisions of the Andaman and Nicobar Islands Fisheries Regulations, 1938. Licencees export shells collected by them to the mainland as well as to the foreign markets.

The average collection of Trochus, Turbo and Nautilus shells during the past five years is as below :—

1. Trochus .. .. 146 tons, 9 cwts. and 19 lbs
2. Turbo .. .. 6 tons, 13 cwts. 2 Qrs. and 21 lbs.
3. Nautilus .. .. —

(Deputy Development Officer, Office of the Chief Commissioner, Andaman & Nicobar Islands—8-11-59)

(vi) *Government of India Deep Sea Fishing Station.*

During the quarter ending December, 1959, the exploratory fishing operations of the Government of India Deep Sea Fishing & Off-Shore Fishing Stations are as follows :—

Name of vessel	Quantity of fish caught			No. of days absent from Port	Catch/days absence			Value realised
	Tons	Cwt.	lbs.		Tons	Cwt.	lb.	Rs. nP.
(1)		(2)		(3)		(4)		(5)
Bombay								
M.F.V. Bangada	64	15	110	40	1	12	3	19,191.50
Jheenga	81	2	0	63	1	5	84	16,328.15
M.L. Pravasi	41	12	38	68	0	12	27	6,103.96
M.L. Meera	32	18	7	62	0	9	0	4,518.14

(1)	(2)			(3)		(4)		(5)
M. L. Sagarkanti	6	11	46	53	0	2	54	3,132.68
M.F.V. Bumili	39	16	39	53	0	15	3	6,606.96
Cochin								
M. T. Pratap	64	1	69	27	2	7	52	12,943.19
M. L. Durga	43	19	9	44	0	19	110	9,445.58
M. V. Samudra	35	4	52	48	0	14	76	6,870.63
M. V. Tarpon	45	10	24	53	0	17	16	10,929.46
M. V. Samudra & Tarpon	2	14	62	7	0	7	89	102.80
M. L. Durga & Flying Fish	3	11	57	7	0	10	24	989.59
Tuticorin								
Sagar Sundari	0	5	67	30	0	0	21	139.29
Meenakshi	0	9	86	18	0	0	61	197.01
Visakhapatnam								
M. T. Ashok	10	15	50	16	0	13	52	1,722.75
M. V. Sea Horse	0	1	38	10	0	0	15	18.25

(vii) *The landings of four bull trawlers of New India Fisheries Ltd., Bombay, for the quarter ending December,* 1959, *are as follows.*

Name of the Vessel (1)	Period of voyage (2)	No. of days absent from the port (3)	Quantity caught (Tons) (4)	Catch/days absence (Tons) (5)	Depth fished (Meters) (6)
Arnalla and Paj	29-9-50 to 12-10-59	14	48	3.4	24-53
	15-10-59 to 24-10-59	10	74	7.4	32-49
	26-10-59 to 3-11-59	9	78	8.7	34-40
	5-11-59 to 15-11-59	11	81	7.4	31-38
	17-11-59 to 25-11-59	9	83	9.2	36-40
	27-11-59 to 6-12-59	10	70	7	34-42
	8-12-59 to 16-12-59	9	75	8.3	30-43

(1)	(2)	(3)	(4)	(5)	(6)
	17-12-59 to 25-12-59	9	52	5.8	37-40
Satpati and Pilotan	26-12-59 to 3- 1-60	9	75	8.3	36-39

(viii) *The Government of India Quick Freezing and Cold Storage Plant at Bombay.*

The income realised from (1) sale of ice, (2) hire of cold storage accommodation, (3) basket storage of fresh fish, (4) freezing of fresh fish and (5) fish frozen in ice blocks during the period October to December 1959 are as follows:—

Activity	Value realised
	Rs. nP.
(1) Sale of Ice	25,752.28
(2) Hire of Cold Storage accommodation	13,897.00
(3) Basket storage of fresh fish	10,818.17
(4) Freezing of Fish	8,790.00
(5) Fish frozen in ice blocks	1,476.00

(ix) *Government of India Quick Freezing Plant, Cold Storage & Ice Factory, Bombay. Statement showing the utilisation of the Plant by the Fishing Industry.*

Financial Year	Quantity of Ice sold	Quantity of fresh fish stored	Quantity of fish frozen	Quantity of Meat frozen	Average frozen fish storage utilized throughout the year	No. of customers who utilised the Plant
	(in tons)	(in tons)	(short tons)	(short tons)	(in tons)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1951-52	1,097	480	—	—	—	—
1952-53	2,682	3,242	110	419	128	80,800
1953-54	2,316	2,504	160	175	179	1,08,605
1954-55	2,315	2,944	191	2	226	65,075
1955-56	3,874	2,917	146	—	215	97,491
1956-57	3,241	3,174	258	20	247	84,348
1957-58	3,431	2,916	176	40	248	97,837
1958-59	3,436	2,760	56	07	228	84,160
1959-60 Upto Dec.' 59.	3,660	2,407	75	11	250	80,517
TOTAL	26,052	23,344	1,172	674	1,471	6,98,833

(x) *Review of the work of the Indo-Norwegian Project for the quarter ending December,* 1959.

Fisheries Section

Under the Boat building programme twenty-six 25 ft. boats were completed and ten boats were under construction. At the Project Boat Yard, repairs, general maintenance work, alterations of INP boats, overhauling of engines of M/V 'Ashtamudi' and extensive repairs of R/V 'Kalava', etc. were carried out. Overhauling of electronic and electrical equipment of all the project's vessels and 'Flying Fish', 'Conch' and 'Pratap' was carried out by the Electronic Expert. One hundred and nine repair jobs were undertaken on mechanised boats issued to fishermen.

Purse seine operation with 'M-1' boat indicated the efficiency of the new big purse seine fabricated at Cochin. Otter trawling and floating trawl trials conducted with 'Ashtamudi', 'Medium boats', 'Flying Fish', and 'Durga' in areas off Mangalore and Cochin gave encouraging results. Fishing experiments with mid-water trawl conducted by 'Flying Fish' together with F/V 'Durga' at Mangalore and Cochin indicated very great possibilities. R/V 'Kalava' after extensive repairs started an integrated programme of fishing experiments and hydrological work.

The performance of 'M-5' boats has clearly shown its unsuitability for any successful trawling with its low powered engine.

The project boats operating at Cochin obtained 1,62,586 kos of fish which was sold for Rs. 20,289. The fishing efforts with 22 ft. mechanized boats were comparatively higher than that of the corresponding quarter in 1958. The total catch of thirty-one 22 ft. mechanised boats in Sakthikulangara and Puthenthura during 2,447 trips was 2,20,380 kos of fish valued at Rs. 60,464. An exceptional feature of fishing during the quarter is the increase in the average income of a boat from Rs. 934 in 1958 to Rs. 1,606 in 1959 for Sakthikulangara and Rs. 470 in 1958 to Rs. 711 in 1959 for Puthenthura. Fishing with nine 25 ft. mechanised boats issued to the fishermen gave a total catch of 20,578 kos. of fish to the value of Rs. 5,549 for 199 trips.

A review of the economic results from the experimental commercial fishing undertaken by the "Medium boats" in 1959 indicate an average yearly income of Rs. 3,691 per crew member and average monthly income of Rs. 307 per crew member provided four men were posted on each boat, while if the boats were owned by the fishermen, the corresponding income would be Rs. 4,025 and Rs. 335 respectively.

At the Refrigeration Plant 19,308 kos. of fish and prawn were received and 17,756 kos. were issued for marketing. Of the quantity of 1,945 kos. of fish taken for freezing, 1,349 kos. of finished product was obtained and issued for marketing.

5,95,300 kos. of ice was produced during the quarter and 6,34,925 kos. of ice was sold at value of Rs. 31,891.

Marketing Section handled 17,756 kos. of fresh and 1,349 kos. of frozen fish. New markets in new routes were explored for efficient distribution.

The 9th batch of fishermen training course was continued. Some of the experimental fishing with INP boats were integrated with the

training programme. The fishing conducted by the training section yielded 2,857 kos. of fish and prawn.

The programme for beach landing trials conjointly with the Central Fisheries Technological Research Station, Cochin was carried out according to schedule at Tuticorin from 15th October to 30th November, 1959.

R/V 'Kalava' and R/V 'Conch' conducted research cruises in the areas between Alleppy and Cochin and as far as Mangalore. Trawling trials on different depths upto 100 fathoms were also conducted.

Health Section

The health work continued in the prophylactic as well as in the curative system. 464 children were vaccinated against tuberculosis.

Construction work

The construction of the Garage for Ice Vans, house for the Assistant Surgeon and staff quarters at the Health Centre are progressing.

Administrative matter

Mr. Gunnar Jyssum replaced Mr. A. Hjelm-Hansen, the Chief Engineer. Two skippers and fishermen with special training in maintenance of gear also arrived in December.

Expenditure

During the quarter the Norwegian expenditure in India was Rs. 2,63,940. The total expenditure since the inception of the Project comes to Rs. 212,02,400 and the Indian expenditure was Rs. 22,04,443 and during the quarter was Rs. 1,38,149.

(xi) *Second Five Year Plan targets and achievements in respect of G.M.F. Fisheries Schemes of Madras State for* 1956-57 *to* 1958-59.

Madras State has 8 G.M.F. Fisheries Scheme for implementation during the Second Five Year Plan. During the first three years, Rs. 13.51 lakhs were given as assistance to Fishermen Cooperative Societies for marketing of fish and Rs. 5.19 lakhs is anticipated to be given in 1959-60 against the target of Rs. 21.93 lakhs.

Under the Salt Subsidy Scheme, 16,557 tons of cured fish was produced against the target of 25,000 tons for the Plan period. The total expenditure upto 1958-59 was Rs. 4.38 lakhs against Rs. 4.92 lakhs for the Plan period.

All the 4 Fishing harbours are anticipated to be constructed during the last two years of the Plan. Expenditure upto the end of 1958-59 is Rs. 0.4 lakhs against the Plan target of Rs. 7.80 lakhs.

Under the Scheme of improvement of fishing crafts 65 Pablo boats were constructed incurring an expenses of Rs. 5.38 lakhs against a Plan target of 100 Pablo boats and Rs. 9.45 lakhs.

300 nylon nets and 14,824 lbs. of synthetic yarn were supplied to fishermen at subsidised rates with an expenditure of Rs. 2.70 lakhs against the target of Rs. 7.80 lakhs during the Plan period.

Fish Curing Yard Cape Comorin, Drying platform

Drying of Fish Cape Comorin

Drying of fish, Cape Comorin

M. V. "Sunderbans"

Tagging of Hilsa

Under the Intensive Seed Collection and Rural Fishery Demonstration Scheme 9.57 crores of fingerlings were stocked during 1956-57 to 1958-59 against the target of 15 crores for five years. The expenditure incurred during the period was Rs. 5.59 lakhs against the Plan target of Rs. 13.43 lakhs.

Under the Development and Exploitation of Major Reservoir fisheries 26.07 lakhs fingerlings were stocked during the first three years incurring an expenditure of Rs. 1.07 lakhs against the target of Rs. 4.50 lakhs.

8-10 vehicles were hired out to Fisheries Cooperative Societies, under the scheme of quick transport facilities from landing centres to marketing centres. The cost of the scheme was Rs. 1.46 lakhs against the target of Rs. 1.99 lakhs for the Plan period.

Inland

(i) *Chinese Grass Carp introduced at Cuttack experimental farm.*

A consignment of 400 fingerlings of the Chinese Grass Carp (*Ctenopharygondon idellus*) was obtained from Hong Kong and are being grown in nursery ponds at the Kila Farm of Central Inland Fisheries Research Sub-station at Cuttack. Possibilities of utilising this quick growing major carp for controlling growth of submerged weeds in ponds will be studied as the fish grows in the new environment and establishes in our waters.

Specimens of the Chinese Silver Carp received in September, 1959, from Japan have attained the maximum weight of 760 gms. in the course of four months.

(Central Inland Fisheries Research Station, Barrackpore)

(*ii*) *Tagging Experiments.*

Extensive tagging experiments were undertaken on Hilsa in the Padma, the Hoogly and the Ganga rivers. 310 Hilsa were tagged and released in these rivers. Encouraging results have been obtained in regard to the recovery of tagged fish. Over 6,000 fishes were tagged in the Chilka lake. Study on the recoveries and the trend of migration of the various species of fishes is under progress.

(Central Inland Fisheries Research Station, Barrackpore)

(iii) *River Surveys.*

A preliminary survey of the fisheries resources of the Brahmaputra river system in Assam was conducted by the Riverine Sub-station. It was found that the Brahmaputra together with the adjoining large number of bheels have very productive fisheries. It was also found during the survey that the resources of the Brahmaputra are being exploited at a level when it appears necessary to implement some conservation measures in order to obtain a sustained and high yield of fish production from these resources.

Studies of pollutional effects of the sugar and distillery wastes on the fisheries of the river Daha in Savan Sub-Division (Bihar) were also conducted.

(Central Inland Fisheries Research Station, Barrackpore)

(iv) *Fish Pathology*

A disease specific to *Catla catla* affecting the eye of the fish which caused considerable damage to catla fisheries in West Bengal was investigated. It was also possible to devise measures to check severe mortality in regard to this disease. Investigation on the infection of the parasite ligula in the fishes of Tilaiya reservoir of the Damodar Valley Corporation was under taken during the quarter.

(Central Inland Fisheries Research Station, Barrackpore)

Technology

(i) *The Central Fisheries Technological Research Station, Cochin.*

(a) *Craft and Gear Wing*

The General theme envisaged in the scheme of work is the development of fishing gear, designs of gear, study of comparative efficiency, preservation of gear, methods of locating fish, reactions of fish in natural and artificial stimuli and hull design of fishing boats, engines, auxiliary fishing equipments, navigation and seamanship. This wing is to comprise of the following branches and Sections.

Craft & Gear Wing	Fishing Gear Branch	*Gear material Section* Gear Design Section Fishing Methods Section
	Fishing Craft Branch	*Craft Design Section* Engine Section Navigation and Seamanship
		Field Investigation Branch Library and Extension Branch
	Training School	Fishing Gear Technology Fishing Craft Technology
		Administrative Section

During the period ending December, 1959, all the Sections in the Fishing Gear and Fishing Craft Branches except the Engine and Navigation and Seamanship Sections were established. Studies and investigation under the different Sections were initiated during the years 1957 and 1958, and further intensified during 1959. Investigations conducted in the different sections of this Wing related to—

(*i*) Investigations on material for the making of twines, nets etc., suitable material for tanning and preserving of nets, and different kinds of antifouling composition for boats and vessels.

(*ii*) Study and designing of nets and other gear likely to prove suitable in our waters both inshore and offshore.

A beginning was also made in organising a library. Two training courses were organised in the field of fishing boat design and construction during the years 1957 and 1958 and an advanced course during 1959.

The participants were nominees of the various maritime States and some private firms interested in the field. To give practical training in boat construction two investigational fishing boats were built at the station. These boats are now being used on investigational vessels for collection of data for the Gear Design and Fishing Method Sections.

Under the supervision of the FAO Gear Technologist, a Shrimp Trawl Training Course was organised in 1959 and theoretical and practical training in Shrimp Trawling was given to nominees of maritime States as well as private firms.

The Craft and Gear Wing of the Station rendered technical advice and assistance on design of boats, nets, selection of engines, method of fishing operatoins etc. to various maritime States and private firms.

(b) *Processing Wing*

Processing Wing is to take up investigations relating to the different aspects of fish processing, storage and transport, studies on the utilisation of fishery products such as fish oils, isinglass, guano, fish meal, fish glue, seaweeds and other marine products etc. and to evolve commodity standards for various fishery products and to develop the basis for a system of fish inspection to ensure good quality fish and fish products for the internal and external markets.

The processing Wing was organised by the middle of 1959. Investigations were carried out on physical, chemical and bacteriological quality of shrimps during the different stages of processing into dry pulp, frozen and canned prawns under factory conditions. The work was being done with the active cooperation of the factories engaged in the processing of shrimps. The technical work relating to the improvement of fish curing practices, preparations of quality fish meal for human consumption etc. and setting up of a fish meal plant at Bombay, were also undertaken.

(Central Fisheries Technological Research Station, Cochin).

(ii) *Preliminary Investigations on Sunn-Hemp Twine As a Fishing Net Material.*

Preliminary investigations were carried out with sunn-hemp twines on the breaking strength, elongation in dry and wet conditions and on the rotting qualities during continuous submersion and it was found out that (a) the approximate weight of sunn-hemp twine per metre is given by 0.33 N. Here N represents the number of 31's yarn. The approximate weight in (mg) of sunn-hemp twine per metre is also given by 0.55 D^2. Here D denotes the diameter of twine in mm.

(*b*) The approximate breaking strength of twine in kg. is given by 3.66 N in dry and 4.1 N in wet condition; 11.25 W in dry and 12.6 W in wet conditions; and 6.2 D^2 in dry and 6.94 D^2 in wet condition. Here W denotes the weight of twine in gm. per metre.

(c) The average breaking strength of sunn-hemp twine in wet condition is 1.12 times more than in dry condition.

(*d*) The sunn-hemp twine is stronger than Indian cotton twine twisted locally and weaker than Manila twine.

(*e*) The breaking stretch of sunn-hemp twine does not differ much with the thickness of the twine in dry condition but in wet condition the breaking stretch increases with the thickness of the twine.

(*f*) The decrease in breaking strength of sunn-hemp twine after continuous immersion in water for a certain time is proportional to the radius of the twine.

(*g*) The resistance of sunn-hemp twine to rotting is considerably poorer than that of cotton twine and Manila twine.

If fibre of select quality is made into twine of uniform thickness and twist, the sunn-hemp twine can be improved considerably.

(H. Miyamoto and A.T. Shariff—Indian Journal of Fisheries, Vol. VI, No. 2, 1959)

(iii) *Preservation of Prawns in ice and the assessment of their quality by objective standards.*

Observations were made on the trimethylamine, total volatile nitrogen, acid soluble orthophosphate and free amino acid nitrogen contents and bacterial counts of Indian prawns (*Penaeus indicus, Metapenaeus affinis* and *M. dobsoni*) preserved in ice. The prawns were found to have a keeping quality of about 10-15 days before spoilage set in. The period of prime quality as seen from the objective tests employed did not exceed one week. Heading the prawns prior to icing minimised the incidence of black discolouration (melanosis) peculiar to prawns and appears to be an essential step if the desired storage duration is more than 1 or 2 days. Trimethylamine and total volatile nitrogen changes are not significant during the first 10 or even 15 days, and are useful for indicating distinct spoilage. Phosphate and more particularly the free amino nitrogen content reflected the number of days elapsed in ice storage and might be used in assessing the changes in iced prawns before the onset of spoilage. The decrease in the amino nitrogen is due to loss of free amino acids through leaching and since free amino acids are present in crustacean muscle in considerable quantity compared with fish muscle, their loss through leaching may be contributing factor in lessening the flavour of prawns kept in ice for extended storage periods. The bacterial flora of the ice prawns consisted mainly of Gramnegative achromic rods and cocco bacilli, and to a lesser extent of orange and yellow pigmented rods and micrococci.

(N.K. Velankar and T.K. Govindan—Indian Journal of Fisheries, Vol. VI, No. 2, Oct. 1959).

Trade

(i) *Pilot Fish Marketing Programme undertaken by the Indo-Norwegian Project.*

A Pilot Marketing Programme for the development of proper handling and distribution of fish on cooperative lines has been started by the Indo-Norwegian Project since 1957. The working of the programme mainly consists of (1) Popularisation of iced fish; (2) development of a taste for frozen fish; and (3) the formation of a sales organisation of the fishermen.

A Cold Storage and Refrigeration Plant consisting of an Ice factory, Cold Storage and Freezing Storage has been set up at Neendakara in 1957 and distribution of fish is being done by six insulated vans. Under this project, consignments of iced fish are being sent into interior markets and a consumer preference has been developed for iced fish over uniced fish in the interior markets. The Project has also introduced the sale of frozen fish into the markets, particularly during the off season where supply of fresh fish is very scanty. The fish caught by the Project vessels at Cochin are marketed either directly by the Project or

through contractors. It is proposed to organise both the supply and distribution side on cooperative lines. The Project, in 1959, undertook an interim Sales Organisation comprising of mechanised boat owners from Quilon to demonstrate the economic advantages that could accrue to the fishermen members of such an organisation.

(Secretary, Agriculture Department Govt. of Kerala)

(ii) *Transportation facilities for fish marketing in Bombay State*

With the exception of a few areas like Ratnagiri District, Kutch region etc., the facilities for transport of fish from landing sites to assembling and consuming centres are fairly adequate in Bombay State. Transport is made by rail, road and sea. The Railway have introduced several improvements with a view to facilitate expeditious transport of fish. Instructions have been issued to reserve sufficient space in the brake-van for fish consignments to be loaded at stations nearest to important fishing centres, to increase the halting time of trains when necessary to load fish parcels, to accept fish parcels by available mail and express trains, relax the quota for fish parcels whenever the fish traffic is increased and to give priority to fish consignments. Fish being a highly perishable commodity, is charged at half the usual parcel rates.

A large quantity of fish is transported by sea in carrier launches. About 20 transport launches and an equal number of sailing crafts operate mainly between Konkan, Karwar, Saurashtra area and Bombay and are owned by private parties. Under the Konkan Vikas Scheme, Government proposes to construct two more carrier launches which would operate Departmentally. From fishing centres in a radius of about 150 miles around Bombay fish is transported in trucks to terminal markets in the city or sent to other consuming centres in the interior. About 25 trucks for transport of fish are owned by fishermen Cooperative Societies in the Bombay and B.S.D. & Thana District. Financial assistance in the form of loan is granted by the Government to the Cooperative Societies, for purchase of trucks to undertake fish transport.

(iii) *Import of Fish and Fish preparations into Ceylon from India and Maldive Islands.* India continues to be the principal supplier to Ceylon of dried and/or salted fish and that the total intake from India is being maintained. The intake of Jadi-wet-salted fish from India is on the increase but the imports of dried prawns from India have recorded a steady fall.

Countries	1957		1958		January-July, 1959	
	Cwts.	V. Rs.	Cwts.	V. Rs.	Cwts.	V. Rs.
India						
1. Maldive Fish ..	3,874	493,800	2,128	323,250	1,417	263,920
2. Sprats, dried ..	70,431	8,191,123	104,185	10,886,571	87,746	7,017,935
3. Other Fish dried but not salted ..	9,098	760,483	4,431	422,548	10,280	1,026,097
4. Fish, salted and dried	286,633	30,401,738	333,058	29,645,361	120,239	12,922,979
5. Fish wet salted Jadi	6,795	177,500	44,075	1,636,863	84,245	2,648,415
6. Prawns, dried ..	18,353	2,057,600	15,473	1,576,678	6,808	750,918
7. Fish Products—Canned	3	613	—	—	—	—
	395,187	42,082,857	419,493	44,491,271	310,735	24,630,264

Contd.

Countries	1957		1958		January-July, 1959	
	Cwts.	V. Rs.	Cwts.	V. Rs.	Cwts.	V. Rs.
Maldive Islands						
1. Maldive Fish ..	56,546	9,412,313	56,451	10,818,767	41,209	7,507,406
2. Fish, salted and dried	1,620	178,281	2,217	172,863	455	35,159
3. Shark Fins ..	47	3,626	55	5,329	31	2,959
	58,213	9,594,220	58,723	10,996,959	41,691	7,545,524

(High Commission of India in Ceylon, Colombo 20-10-1959)

Conservation and Management

Fisheries Legislation in the Punjab and need for Public Cooperation

Punjab Government was first to promulgate the Indian Fisheries Act of 1897. Afterwards, "The Punjab Fisheries Act" was passed in 1914 and amended in 1923 and 1942. The Act consists of the following:

(1) *Licensing and leasing of waters*

In the first instance licences were issued which, after partition, was replaced by leasing of public waters giving prefernece to fishermen co-operatives and side by side angling licences for sports sake are also issued. There were different legislation for 'Trout' in Kulu valley.

(2) *Close seasons*

The spawning period generally from 1st July to 15th August is observed as 'close season' and no fishing on commercial scale is permitted. For 'trout' the close season is from 1st November to-late of February.

(3) *Size Regulation*

The minimum size of Rohu, Mori (Cirrhina), Thaila (Catla) and Kalbasu is 10″ and for Mahseer is 12″ .

(4) *Mesh Regulation*

Nets of mesh below $1\frac{1}{4}$″ in hills and $1\frac{1}{2}$″ in plains are prohibited for fishing as also the filter nets.

(5) *Declaration of sanctuaries*

Fishing in places where spawners congregate is prohibited.

(6) *Prohibition of fixed engines*

The contrivances fixed in the soil for killing or causing obstruction to migratory movements of fish resulting in their wholesale distruction is prohibited.

(7) *Prohibition of poisoning and Dynamiting of public water.*

Need for public cooperation

The area of the rivers, streams and canals etc., is so vast that complete check by the machinery provided for enforcing various provisions of the fisheries Act can not be maintained and the laws can only be successful with the backing and full public cooperation. The public can render help by putting an end to mal-practice of dynamiting and poisoning, fishing of brood fish in breeding season and by discarding other illegal

contrivances for capturing fish. The use of electric shock should be avoided which causes the mass mortality of fish at canal Headworks. So the problem of fish conservation, though complex one, can be best tackled by the close cooperation between the Government and the Public.

(Sharma R.B.—Asstt. Warden of Fisheries, Ferozepore)

MARINE FISHERIES RESEARCH

Progress of scientific work done at the Central Marine Fisheries Research Station, Mandapam for the quarter ending December, 1959.

Fishery Survey

A revised scheme for the collection of data on marine fish landings was introduced on the West Coast. The total landings of marine fish for the third quarter of 1959 were 111,604 m. tons as compared to 136,323 m. tons for the corresponding period of 1958. There was a slight increase in the landing of Mysore and Saurashtra and marked increase in that of Bombay due to improvements in the fishing for eels and Pomfrets but the increased landings in these States were offset by the decrease in the landings of Madras and Kerala resulting in decreased total landings. In Kerala there was heavy decline in the landings of Oil Sardine, other Sardines, Perches, *Caranx,* Mackerel, *Leiognathus* and Cat Fishes.

Fishery Biology

Inshore Fisheries Investigations

Inshore fisheries investigations on the fishery and biology of Oil Sardine and other Sardines, (*Sardinella fimbriata, S. gibbosa*), *Anchoviella* spp. *Hilsa ilisha,* etc. were continued at Karwar, Mangalore, Kozhikode, Cochin, Neendakara, Mandapam and Waltair and that of Mackerel at Karwar, Mangalore, Kozhikode, Vizhingam and Porto Novo, with special reference to catch per Unit of effort with various gears, morphometric and meristic studies, population studies, size composition, length frequency and age studies, maturity, food and feeding habits.

Studies on Prawn fishery, and biology of commercial species of prawns belonging to *Metapenaeus, Penaeus, Leander, Palaemon* etc. were continued at Kandla, Bombay, Mangalore, Kozhikode, Cochin and Madras. At Bombay studies were continued on the prawns occurring in the inshore areas on the basis of dol net catches. The rich prawn fishery in October and November appears to be associated with the upwelling of the waters off Bombay during these months. The mass migration shore-wards appears to coincide with the breeding phase of most of the penaeide. At Cochin the recruitment studies of prawn fisheries were continued. Studies on the biology of *Palaemon* at Cochin showed that this species breed in or near the backwaters between September and December with a peak during October-November.

Inshore fishery biology investigations on other important food fishes like Malabar Sole (*Cynoglossus semifasciatus*), Half beaks (Hemirahmpus spp.), Mullets (Mugil spp.) Tunnies, spiny lobsters were carried out at Kozhikode, Mandapam and Cochin. Studies on the fishery and biology of the Tunny *Katsuwonus pelamis* from the Minicoy region are nearing completion and the studies on the feeding and spawning of an important baitfish of Tuna (*Lepidozygus tapeinosoma*) have been initiated.

Studies on Pearl oyster populations from Pernando Parr and Devi Parr on the northern side of Tuticorin showed a total estimated popula-

tion of 2 lakhs 50,000 oysters respectively. Though the oysters would have reached the size for commercial exploitation, there was no indication of a successful fishery due to the thinness of the population of the parrs.

Off-shore Fisheries Investigations

Off-shore fisheries investigations included observations on the mechanised fishing at Bombay, Cochin, Tuticorin and Calcutta.

At Bombay, 3 mechanised vessels of the Deep Sea Fishing Station fished off Veraval and Porbander waters operating trawl net and gill nets landed 73,136 kg. of fish during the quarter. Studies were continued on the fishery and biology of trawl fishes like Dara, Ghol, Koth, Karkara and Bombil. Analysis of data from scale and length frequency studies indicated that the rings on the scales of Koth (*Sciaenoides brunneus*) are true annuli.

At Cochin, the vessels of the Indo-Norwegian Project and Government of India Off-Shore Fishing Station carried out experimental trawl net operations. An interesting feature was that the catches landed by M.T. 'Pratap' from a depth of 17—22 fathoms off Quilon and Kayamkulam consisted mainly of large sized maturing females of *P. indicus*. The general trend of fishing shows that the present yield of 'Pratap' reconverted into otter trawler using V-D otter trawl is significantly lower than when operating bull trawls from the same area. The catch details show that there is a considerable decrease in the Catch-per-Unit of effort in November; and higher concentration of Kilimeen (*Nemipterus japonicus*) was found constantly in the 20-22 fathoms depths in Area 108 and 107. Experimental purse seining was started with M-1 Boat. Studies on the biology and fishery of *Nemipterus japonicus* was in progress.

Fishing vessels 'Ashok', 'Sagar Kumari' and 'Sea Horse' at Waltair and 'Sagar Sundari' and 'Meenakshi' at Tuticorin made a number of exploratory trips and the off-shore catches of the vessels were analysed.

The West Bengal Fishing Trawlers made 11 voyages in the Bay of Bengal during the quarter and the catch data relating to composition of catch, area of fishing etc. was collected and studied.

Physiology and Marine Fish Farming

Phsiological studies on the metabolism of *Tilapia* acclimatised in sea water and tap water was in progress. The Pamban creek survey was continued. Observations on the growth of milk fish (*Chanos Chanos*) in the experimental marine fish farm indicated a general retardation of growth of the fish due to lack of artificial manuring of those ponds and the study is in progress.

Marine Biology

Planktological investigations were continued at Karwar, Mangalore, Kozhikode, Mandapam and Madras. The estimation of the organic production in the sea by the 'dark and clear bottle' method was attempted at Kozhikode.

At Mandapam observations on the plankton of the inshore waters around Mandapam, studies on organic production from six inshore stations in the Gulf of Mannar, basic production in the inshore waters and the off-shore plankton of the West Coast were continued. The data

collected regarding the seasonal distribution of Chaetognaths in Palk Bay and the Gulf of Mannar during 1955—1959 were finalised. Detailed work on the collection of Chaetognaths from the Laccadives was in progress.

Oceanographical studies on the hydrological conditions of the inshore and off-shore waters off Bombay, Karwar, Mangalore, Kozhikode and Cochin were continued. At Bombay analysis was carried out of the hydrological data collected during 1956—59. Hydrographic data collected at Cochin revealed certain interesting features in the hydrological condition of the waters off Cochin. In early October the upwelling was still present but by December there was definite evidence of sinking or "downwelling". The analysis of the data collected in May, 1959 (a typical pre-south west monsoon condition) during the Cochin—Calicut cruises was completed. The hydrological study of the backwaters around Wellingdon Island was also made.

Algology

A method of obtaining colourless agar from *Gelidium* and *Gracilaria* has been worked out. The method gives the agar a highly porous texture. A new genus of Algae was collected from the pearl beds off Tuticorin and is under study.

(Central Marine Fisheries Research Station, Mandapam Camp)

Fishery Biology

(i) *The fishing industry of Minicoy island with special reference to the tuna fishery.*

The results of visits and information collected from 1954 to 1958 for the coral island of Minicoy—the most important tuna centre in the Indian Union; an account of fishing people; fishing tackle; craft and gear and the pattern of the tuna fishing industry are given in detail. The various methods of fishing are briefly described.

In all about 154 species of fish which have been identified and about 10 unidentified ones were recorded, of which the oceanic skipjack, *Katsuwonus pelamis,* mainly contributes to the fishery. Its season lasts from September to April, the peak being December to March. Export figures of "mas min"—cured and dried meat of tuna have been shown.

Brief notes on fish of special interest are given at the end. Mention has been made of *Thalassosteus appendiculatus,* a belonid fish recorded for the first time from Indian waters. The extent of skipjack fishery product and other fishes which are suitable for curing, is discussed.

(S. Jones and M. Kumaran—Indian Journal of Fisheries—Vol. VI, No. 1, pp. 30 – 57).

(ii) *Notes on the bionomics of the prawn, the Metapenaeus monoceros, Fabricus.*

Metapenaeus monoceros constitutes one of the commercial prawn fisheries of the Cochin backwaters. The samples were collected during 1952—55 and 1957. In the present paper some aspects of the bionomics of *M. monoceros* such as growth, age, composition of catches, length weight relationship, number of moulds, breeding and migration are dealt with.

Prawns born in November-December which is the peak of the spawning season, grow to a length of 86—90 mm. by August-September and thereafter this mode disappears in the monthly length frequency curves, thereby showing that it is the zero year class, which supports the fishery in the backwaters whereas three classes are represented in the off-shore catches. Early post-larvae seem to migrate to the backwaters and migration back to the sea commences after a length of about 100 mm. is reached. The length-weight relationship shows the normal pattern, the formula being W=0.01989 L 2.7603. The number of moulds for growth from 3-100 mm. is 32. The paper is illustrated with necessary graphs and tables.

(M. J. George—Indian Journal of Fisheries, Vol. VI, No. 2, Oct., 1959)

(iii) *Some aspects of the Fishery and Biology of Polydactylus indicus (shaw).*

Polydactylus indicus, popularly known as 'Dara' is one of the major fishery of Bombay and Saurashtra waters and the paper deals with its fishery and biology. It is stated that fully grown maturing 'Dara' are found in good numbers in the Bombay and Cambay regions. The fishery is well exploited by the fishermen of Satpati and Dahanu by the use of bottom-set gill nets. 'Chelna' the immature 'Dara' are landed mainly from the Dwarka region by the trawlers. The areas K & M are extremely rich grounds for the 'Chelna' fishery, forming nearly 30% of the total catch during the season.

P. indicus appears to spawn twice in a year, once in April to June and again in October to December. Fecundity studies indicate a high rate of recruitment. Study of growth in *P. indicus* was attempted by the method of length frequency analysis. 3,376 specimens collected from Dwarka region were measured. The Dwarka Fishery seems to consist of the First, Second and Third year classes as well as the intermediary classes of one and a half and two and a half years.

(Mirs P. D. Nayak—Indian Journal of Fisheries, Vol. VI, No. 2, October, 1959)

(iv) *A method of distinguishing the sex of the Oil sardine, Sardinella longiceps val. in the field.*

Sex determination being the important fishery biological investigation, the work was done by many authors on various fishes. In the article an externally visible muscular papilla in the cloaca of the male oil sardine and the corresponding membranous structure in the female are described and their usefulness for quickly sorting out the sexes is explained. The gaping cloaca and the prominence of the above described characters are shown to be helpful in recognising the spent and spent-recovering conditions of the oil sardine. The presence of the above mentioned papillae in the case of other sardines commonly found in Indian waters pointed out and their possible utility in sex composition is indicated. In the paper a table showing the details regarding size range, maturity etc. of the fish examined is also given. In view of the success of the method in case of *Sardinella longiceps,* this can also be tried in case of other allied fishes like Hilsa spp. etc.

(K.C. George—Indian Journal of Fisheries Vol. VI, No. 2, Oct. 1959)

Hydrobiology

(i) *Seasonal variations of the hydrological factors of the Madras coastal waters.*

Studies were made on the variations of Hydrogen ion concentration, salinity, dissolved oxygen and nutrients in the surface waters of the Madras coast for a period of 24 months from June, 1956 to May, 1958. The salinity of coastal waters showed marked seasonal fluctuations registering low values during the north-east monsoon period and increasing gradually from January onward to record the maximum values during the summer months. The coastal waters are influenced by the southerly and northerly currents alternately. During the north-east monsoon period, there is an influx of fresh water from Cooum and Adyar rivers which brings marked lowering in salinity of the coastal waters.

The nutrients salts also showed seasonal variations. During the north-east monsoon period the concentration of the silicate and nitrite were up due to the discharge of fresh and polluted waters from the rivers, the Adyar and Cooum. After the cessation of the north-east monsoon the concentration decreased. The high concentration of all the three salts from April to August has been attributed to the sub-surface water coming to the surface.

The dissolved oxygen content of the coastal waters also showed some variations. The value was high during the north-east monsoon period and was low during April to August. The hydrogen ion concentration did not vary considerably.

(P. Udaya Verma Thirupad and C. V. Gangadhara Reddy—Indian Journal of Fisheries—Vol. VI, No. 2, Oct., 1960.

INLAND FISHERIES RESEARCH

Progress of scientific work done at the Central Inland Fisheries Research Station, Barrackpore, for the quarter ending 31*st December,* 1959.

Pond Culture Division

Investigations on the breeding and biology of the Common Carp *Cyprinus carpio* was continued at Cuttack. Successful spawning of *Cyprinus carpio* took place and the maximum number of spawn obtained from one fish exceeded 2 lakhs. The survival of fry ranged from 30 to 70 per cent and size attained during the first 15 days of rearing in nurseries compared favourably with that of the Indian Major Carps. The fry obtained by the first successful breeding of Mirror Carp in the plains at Cuttack showed a growth of 6 to 10 cm. by the end of about three months. The Pond culture sub-station supplied over one lakh fry and fingerlings of major carps and *Cyprinus carpio* to Orissa State.

Experiments are in progress for studying growth of Chinese silver carp obtained from Japan and observations showed that fish have attained an average weight of 120 gms. and a maximum weight of 790 gms. in four months. About 380 fingerlings of Chinese Grass Carp obtained from Hong Kong are reared in prepared nursery ponds in the Killa farm.

In order to ascertain whether fish production can be appreciably enhanced by intensive manuring an experiment has been initiated. Maximum production was recorded from ponds manured with mustard oil cake indicating a possible production of 5,000 lbs. per acre per annum.

Field experiments on Tilapia culture indicated that popular harvesting help in maintaining the size of marketable fish higher and by monosex culture male Tilapia attained 12 to 15 cm. during one year at an initial density of 1,000 per acre.

Pond culture studies at Jeypore indicated that silk worm pupa powder is a better artificial food for carp fingerlings than mustard oil cake.

Weed control investigations at Dalwak indicated that ammonia at 20 ppm. applied in gas form kills submerged plants like Hydrilla and Vallis completely within two weeks. Ammonia has been found effective against Wolffia, Monochoria and Ichhi and Diuron on Monochoria and Cyperus. Cost of clearing a thick infestation of submerged weeds from one acre of water 5 feet deep worked out cheapest by sodium arsenite Rs. 124. Experiments on the use of seeds of the wild neem as a fish poison is in progress.

Studies on soil composition in relation to fish production was undertaken in selected tanks in Cuttack, Laughlow, Puri, Balasore, Berhampur and Sambalpur.

Reservoir and Lacustrine Division

Reservoir and Lacustrine Division continued investigations on catch statistics and exploitation of commercial fisheries in the Ganga, Narbada and Godavari river systems. In a stretch of 125 miles of river Tapti 118 villages were surveyed of which 57 were fishing villages with a fisherman population of 13,187. A basic survey of 261 miles stretch of the Godavari upstream from Rajahmundry was completed.

Biological investigations on the commercial landings of carp and catfishes from Ganga and Jamuna with special reference to species composition, maturity and spawning, fecundity and breeding, food and feeding, age and growth were continued.

Investigation of the biology and fishery of fresh-water prawns which is of considerable importance in the Godavari was initiated. Determination of age and growth markings on scales, vertebrae, etc. of the commercial species of fish from the Ganga River was initiated.

Stream pollution studies on pollutional effects of the sugar and distillery wastes on the fisheries of river Dahs in Sarun (Bihar) causing fish mortality were continued.

Investigation on carp seed resources and location of spawn collection centres in the Godavari indicated that breeding of Major Carps extend to end of September and prawns commence breeding towards end of September.

Ecological investigations on the river Ganga was undertaken to find out the effects of physicochemical and biological factors on the distribution and abundance of major fisheries of the Ganga.

Lacustrine investigations on Tungbhadra Dam and Krishnaraja Sagar was continued with special reference to the biology of the reservoir fishes, fishing tackle in operation, fish catches from the reservoir, bottom fauna, plankton and limnology of the reservoir. Observations on fisheries in Chilka lake were initiated.

Estuarine Division

Studies on the fisheries and fish population and environment of Hooghly—Matlah system and Mahanadi estuary was continued. Additional survey was undertaken for the winter fisheries in the estuarine areas and a pilot survey was conducted in zone II of the Hooghly to estimate the sampling error and assess the suitability of the design now followed for collection of catch statistics. A new market sampling procedure was designed for the estimation of total catch from the Mahanadi estuary.

Under the programme of exploratory fishing in the Sunderbans the Research Vessel M. V. "Sunderbans" started preliminary charting and fishing experiments in the Sunderbans.

Investigations on Hilsa fisheries in the Hooghly, Padma, Ganga and Godavari was continued.

Studies on the culture of brackish water fishes at the Brackish water fish farm in Orissa was continued with reference to soil nutrients, algal production, other hydrological features of the ponds, manuring etc.

Chilka lake investigations

Chilka lake investigations were continued on the commercial fisheries of the lake, craft and gear employed, biological observations on commercial fishes and physico-chemical features of the lake. Observations indicated that the Sea-ward breeding migration of mature Mugil cephalus and Lisa macrolepis occurred during the fourth quarter during high tide.

An intensive tagging programme was launched which is expected to throw light on the fish movement, rate of exploitation, growth and certain aspects of population dynamics of the Chilka lake fisheries.

Fish Pathology investigations.

Detailed investigations were taken up on several cases of fish mortality in tanks in different areas of West Bengal due to certain eye diseases of fish specific to Catla catla. Group treatment was tried and Rs. 35,000 worth of fish have been saved by these experiments. Detailed studies on the disease are in progress.

(Central Inland Fisheries Research Station, Barrackpore)

Fishery Biology

(i) Observations on some spawning grounds of the Gangetic Major Carps with a note on Carp seed resources in India.

Several extensive spawning grounds of the cultivable carps e.g. Rohu, Catla and Mrigal have been discovered in the Ganga River system. The Minor "Dhars" an interlacing channel system spreading over an area of 250 sq. miles in Saharsa and Darbhanga districts of North Bihar, annually become "alive" by spilling flood waters of the main Kosi over its banks and serve as the foremost areas where these carps are now found to spawn. The jheels connected with the Burhi Gandak and the 'Char' lands, i.e. the slightly elevated alluvial and sandy islands and banks of Ganga, are also known to attract fish for spawning. Gravid adults of both sexes occur in these regions at the commencement of the floods and a seasonal monsoon fishery exists for spawning fish in many of them. Abundant number of drifting eggs showing just fertilised to well advanced embryonic stages have been obtained in the Kosi 'dhar' as long as the fish movements lasted in them. These and related observations

on the appearance of spawn, fry and fingerlings have been discussed. Necessity and scope for further study in view of availability of mature fish for experiments in obtaining pure seed of required species are stressed. Suitable steps to protect them and their fry and fingerlings in riverine environments, with instances from several regions in India are discussed.

(David A—Indian Journal of Fisheries, Vol. VI, No. 2, October, 1959)

(ii) *Active respiration of fish in relation to ambient concentrations of oxygen and carbon dioxide.*

The oxygen consumption at a steady rate maintained by a mild electric stimulus was increased for *Salvelinus fontinalis* (Mitchill), *Catostomus commersoni* (Lacepede), *Ameiurus nebulosus* LeSueur, *Cyprinus carpio* (Linnaeus) and *Carassius auratus* (Linnaeus) in the presence of various combinations of oxygen and carbon dioxide. At a given level of oxygen the logarithm of the rate of oxygen consumption decreases linearly with the concentration of carbon dioxide. The linear relation so found is characteristic of a given species and the sensitivity to carbon dioxide decreases with increasing acclimating temperature. The oxygen concentration determines the level of active oxygen consumption in the absence of carbon dioxide and when the concentration approaches the lower lethal limit the effect of the addition of carbon dioxide is enhanced. The data found for these species for active metabolism was combined with data in the literature for resting metabolism to give estimates of the metabolism available for activity. The respiratory sensitivities of the four species were further compared by considering the estimated combinations of oxygen and carbon dioxide required to bring about asphyxiation in both flowing water and sealed containers. The ability of the blood of the fish to take up oxygen in the presence of carbon dioxide shows no direct relation to the ability of the fish to transport oxygen to the external medium under similar circumstances.

(S. P. Basu—J. Fish Res. Bd. Canada 16(2), 1959)

FOREIGN

GENERAL AND DEVELOPMENT

Marine

(i) *Sweden's Fishery Catch*

Swedish fishermen in 1958 almost equalled the record 1955 catch. In 1958 they landed 148,438 metric tons of fish in Sweden and 44,568 tons in foreign ports (28,347 tons in 1957). Herring comprised 45 per cent of the total catch and ground fish 20 per cent. The herring foreign landings were up 57 per cent on 1957 and comprised 67 per cent of total foreign landings. By value, 90 per cent of foreign landings were in Denmark. Exports (including foreign landings) in 1958 were worth 18.5 million dollars, and imports were valued at 20.5 million dollars. The volume of frozen fillet imports was 40 per cent above 1957 and 72 per cent of these imports were from Norway.

(Fisheries Newsletter, 1959, page 17)

(ii) *Ghana—Plans for development of Fisheries*

Projects adopted for meeting fisheries production problems were outlined by Ghana Minister of Agriculture. The fishing industry will be aided by the construction of a large fishing port at Tema and a smaller

port at Ekala for small trawlers and other powered craft. It is also proposed to establish properly organised marketing facilities at the landing ports. The markets will be managed by the Agricultural Development Corporation under the guidance of an expert attached to the Ministry of Agriculture.

(Commercial Fisheries Review, March, 1959, page 69)

(iii) Ceylon adopts dredging technique for fishing pearl oysters:

The Fisheries Department of the Government of Ceylon has successfully conducted pearl fishery operations recently in the Gulf of Manaar off the North-West Coast of the island by the technique "Dredging". It has also been pointed out that formerly the conduct of the pearl fishery depended entirely on divers and accompanied boats and that each diver was able to bring up only about 400 oysters in a day and that last year two trawlers gifted to Ceylon by the Canadian Government under the Colombo Plan were used in the operation and that the two dredges working on either side of each trawler scooped up about 13,000 oysters an hour.

(Director of Fisheries, Madras)

(iv) West Indies Meteorological service storm and swell warnings:

One of the most important functions of the West Indies Meteorological Service with office in Trinidad, provide warnings often of primary concern to fishermen, of adverse weather and sea conditions which are likely to affect fishermen or shipping over the area. The warnings and forecasts are clearly worded and give the maximum amount of information so that action may be taken to reduce the effect of bad weather or rough seas on the livelihood of fishermen. These warnings range from hurricanes to damaging swells which build up rapidly in otherwise fine and quiet conditions.

(West Indies Fisheries Bulletin No. 3, May-June, 1959)

(v) Artificial Reef to Lure Fish

A report from Texas states that the first artificial reef has been built off the ship channel east of port Aransas. Two hundred old car bodies were bundled together in groups of five and dropped off barges on hard bottom in 18 fathoms of water. Special care was taken to place buoys in the immediate vicinity to warn shrimp trawler crews to give special clearance to the area to prevent fouling of shrimp trawls. The artificial scrapper banks are new to Texas. Gulf fishermen in other states have found that such reefs really produce the fish in areas where no fish were to be found previously. The whole set up is to produce a condition similar to an old ship wreck. Fishermen make good hauls around such obstructions at almost any time of the year. Biologists base the operation on natural growth of barnacles, oysters, etc. on metal submerged in sea water. Small fish come and feed on barnacles and larger fish come to feed on the smaller fish, while top water fish are also attracted by such reefs. The Commission has promised reefs at other suitable places not too far from shore at a price around 7,000 dollars and a couple of hundred old car bodies.

(Fisheries Newsletter, January, 1959, page 9)

(vi) *Researchers seek new uses for fish oils*

U. S. Chemists are studying fish oil to find new uses. Fish oils can be used as an ingredient in over 100 food and industrial products, including soaps, paints, varnishes, leather conditioners, cooking oils, and poultry feeds. But in many cases fish oils are less desirable than other organic oils primarily because they are chemically less stable and turn rancid. The U.S. Bureau of commercial fisheries and other groups have worked to develop new uses for fish oils either by utilising these unstable properties as valuable assets in the manufacture of chemically modified products or by improving the stability of the oil. The most promising development so far appear to be the use of fish oils constituents for ore collection by the floatation process. This is being conducted at the University of Minnesota school of mines and metallurgy. The fish oil can be used to recover iron from low grade ores. Other laboratories are engaged to find out other applications and improved processing techniques. Possible new applications include the use of fish oils in fungicide, insecticides, pharmaceuticals for coronary disease.

(Commercial Fisheries Review, January, 1959, page 18)

(vii) *Foam Plastic Insulation*

Vakuskum, foam plastic insulation material is being manufactured in Norway. This material has many possibilities of application. It is used in building industry, panelled wooden buildings for pipe and utility channels, inside insulation of roofs and floors and for prefabricated elements. In the technical industry this insulation is used in refrigerators, refrigerator cars, conditioning rooms and freezer compartments, silos and oil storage tanks.

Vakuskum can withstand temperatures to 150° C without detrimental effects and does not change properties at extreme freezing temperatures. It cannot burn and is not inflammable. Due to its content of formaldehyde, the material kills all living matter in the space which it occupies. Insulation may be carried out at a high rate of speed, thus cutting insulation cost considerably. Test carried out also revealed that it does not change the pH of the water. It dries quickly and hardens in few minutes. It does not change its consistency or other properties after 24 hours of curing.

(Norwegian Fishing News, Vol. VI, No. 3, page 13)

(viii) *Causes of fluctuation in stocks of Haddock on North Atlantic Banks.*

It is believed that fluctuation in haddock stocks on North Atlantic Banks is due to variable ocean currents which sweep the haddock spawning areas. Eggs and larvae are thus carried off into the areas of great depth and perish in the millions. Biologist opines that perhaps one egg in 20 or 30 thousand or more may actually survive. Many are eaten by predators at various stages of growth, many eggs remain unfertilized and many more drift off the grounds at the mercy of the ocean currents.

Thus the fishery on the North Atlantic Bank depends on new year classes of fish to replenish the populations and when, for various reasons, spawning is unproductive, a decrease in the stock is expected. Secondly haddock grow much more slowly on North Atlantic Banks than the races found on more southerly grounds.

(Commercial Fisheries Review, Vol. 21, No. 2, February, 1959, p. 55)

(ix) *California catch samples show two dominant year classes.*

The commerical catch of sardines was slightly over 100,000 tons in 1958. Samples obtained from the landings showed a decrease in the numbers of larger fish, a slight increase in small fish (1957 class), and the increasing dominance of the 1956 class. Approximately 75 per cent of the fish samples were between 7 and 8 inches in standard length, and only 12 per cent were larger than 8 inches. In contrast, approximately 35 per cent of the fish landed during September were over 8 inches in standard length.

While fish of the 1957 class have been dominant in the catches made off Monterey, fish of the 1956 class have been dominant in the fish caught off southern California. This is not inconsistent with the Bureau's previous findings and the 1957 class may still prove to be of greater size than other recent year-classes. Normally, any particular year-class will make its greatest contributions to the class as 2 and 3 year old fish. The influx of fish of the 1956 class is somewhat of a surprise, largely because it is probably of fairly southern origin and was, therefore, not well represented in the southern California bait catch in 1957.

(Commercial Fisheries Review, March 1959, page 45)

(x) *Fishermen's Submarine eye.*

Severyanka, the Russian Scientific Research Submarine made her first cruise in December, 1958 and has since made three more cruises in the North Atlantic and the Barents Sea, covering a distance of about 10,000 miles. The aim of the research vessel is not only scientific but practical too to help fishermen.

The vertical migration of Herring has been noticed, in the day descend very low and towards the evening they rise to the upper layers of water. Thousands of silvery fish were seen in hypnotic stage and hibernating. Observations were made in trawl and drift net fishing to enable the fishermen to catch the fish conveniently. The expedition began to study the lighting and good knowledge of the lighting regime in the sea will explain, to no small degree, the conduct of fish in natural conditions.

Efforts are being made with this submarine laboratory to fathom the secrets of the seas more and more.

(L. Novikev)

(xi) *Fish have fleas too*

Like dogs and other mammals, fishes have their fleas, ticks, and other irritating pests. Scientific study of these parasites has many useful applications for the fisheries. A fascinating recent development has been the discovery that some parasites can be used as living tags to trace fish movements. This technique is being employed to determine how many salmon born in Alaskan, Canadian, and Russian waters are caught in the Japanese high-seas fishery. The knowledge is being used to allocate fishing areas in the North Pacific.

(Commercial Fisheries Review, February, 1959, page 11)

Inland

(i) *European Nations to discuss Inland Fisheries.*

An organisation designed for discussion and combined action on common problems of European inland fisheries will hold its first meeting from 25-30, April at Dublin, Ireland.

The new group is known as the European Inland Fisheries Advisory Commission (EIFAC) and is sponsored by the Food & Agriculture Organisation.

All European members of FAO have been invited to the meeting as participants or as observers. 14 countries have already signified their desire to become commission members. Five international organisations, involved in work related to fisheries have been invited to attend as observers.

The new commission resulted from a meeting of an inter-governmental group of inland fisheries experts in Helsinki, Finland, in 1956. This group recommended that FAO establish an organisation to meet the specific needs of European inland fisheries services.

Although European fish culture has already reached a high degree of development, the pooling of research methods and techniques should increase food production far beyond that achieved by traditional means. This commission is planned as a means to present discussion and take combined action on problems common to the fresh water fisheries of Europe. Among these are prevention of water pollution, control of aquatic weeds and fertilisation of fish ponds, and removal of predatory fish.

At its first meeting, the commission is expected to establish its rules of procedure and to set up its internal structure.

(Food & Agriculture Organisation of the U.N.)

(ii) *Fishing methods and potential in lake Tanganyika.*

Lake Tanganyika about 400 miles long and approximately 50 miles wide is a rich fishing ground, especially the Northern part lying in the Belgian Congo. About 350 species of fish, many as yet un-named, comprise almost the whole of the commercial and native catches.

The method of fishing have been described. Fishing is done at night from dug out canoes with the help of lamp and scoop net. The gear can only be used in moonless periods—about 20 days a month. The catch is solely Ndakala, and averages 60—80 per night.

An improved type of boat made up of sheet iron has been introduced by the Belgian Fisheries Service. A completely new type of gear, the lift net has been evolved by the Caisse des pecheurs. The mode of operation etc. of lift net has also been described. The gear is also used on moonless nights and it has been observed that the catch showed improvements over the previous type. It is claimed that catch 30—40 lbs. per haul, and ten or twelve hauls may be made in the night. Sometimes a canoe tow catamaran to and from fishing grounds.

The Greek owned companies are operating ring net units. Each unit consisting of a parent ship, a net boat and 4—6 lamp boats. The lamp boats with lamps lit, are moored to anchors some 5—10 miles off-shore at selected spots where water is deep. The parent ship returns to shore and crew sleep until midnight. The ring net is flaked down on the parent ship. At midnight the parent ship returns to the first of the lamp boats, towing the net boat with crew. The ring net is shot around the first lamp boat and hauled with the lamp boat in the centre of it until the last moment. Similarly the net is shot around other lamp boats. The catch for one night is said to average 4,600 lbs.

(World Fishing—February, 1959 pp. 52—54)

(iii) *New weed-killer.*

A new general purpose chemical weed-killer (Weedex) developed by Fison's Pest Control Ltd. of U.K. is based upon 2-chloro-4, 6-bis (ethylamino)-s-triazine (simazine) one of the newly discovered triazine herbicides. Weedex contains simazine and an inert filler and has unique advantages. Water solubility is extremely low (5 p.p.m.). It remains in the soil surface layers for long periods and can be applied in early springs. It shows little or no herbicidal activity through the leaves but acts entirely through the roots. It has a wide range of effectiveness against weeds, but weed species vary in susceptibility. Weedex is completely safe for human beings, animals and fish and is non-inflammable and non-corrosive to equipment.

(Research and Industry, Vol. 4, No. 5, May 1959, page 127)

Technology

(i) *Commercial fish flour plant for Sweden.*

The first full scale commercial plant for the production of edible fish flour is being built in Sweden by a local pharmaceutical manufacturing concern. This, marks a significant step forward in man's effort to produce a cheap and plentiful supply of animal protein. The manufacturing concern, which is building the flour factory, has perfected a method for producing an odourless and tasteless flour, containing 85 per cent animal protein content of fish and meat in fresh state. This is one of the highest concentrated protein substances yet produced by man.

The new flour can be used in making bread, cakes, pastries etc., and can be added to soups and sauces and other food stuffs. Production of "protein enriched" bread by including up to five per cent edible fish flour adds only a fraction of the cost.

The flour is produced in a closed-circuit plant, fresh fish being fed into the plant at one end and the flour being delivered at the other end. Any type of fish can be used. The vast quantities of trash fish, which are delivered to the fish meal plants, will be equally suitable for the production of fish flour. This provides a more direct and efficient use of the animal protein for human consumption. The development of this method of manufacturing edible fish flour is of great practical significance for the under-developed countries and the Swedish concern is planning to establish plants in various parts of the world.

(Trade News—April, 1959—page 17)

(ii) *New type log and speed indicator developed for trawlers.*

A new type log and speed indicator has been designed and produced by a British firm primarily for the specialized conditions and demands of trawlers. The instrument differs from the conventional log in that it is streamed from the ship's side, being boomed out 5 or 8 feet from the vessel, so that the rotator is in undisturbed water, level with the bridge, where it cannot foul propeller or gear during shooting or hauling the trawling gear. A small register, mounted on the inboard end of the boom, transmits speed and distance readings with great accuracy to instrument located in the wheelhouse; a second distance reading is provided by a dial on the inboard end of the boom. The boom is fitted with a topping lift and forward guy, and is easily handled and streamed. Two speed-range readings are provided. It is claimed that the new instrument will indicate when the gear settles on the bottom, when it lifts, and what it is snagged.

The distance repeater registers in tenth of a mile up to 1,000 miles, and provision is made to feed speed readings to the latest type radar units. The instrument operates from 110 or 220 volts d.c. or a.c., or from a 6-volt battery. It costs £ 158.

(Commercial Fisheries Review, February, 1959, page 70)

(iii) *Use of Tricaine Methanesulphonate in the transport of live fish without water.*

A technique for transferring adult live fish without water has been developed by the Canadian Wildlife Service. In this method the fish are anesthesized with Urethane and packed in ice for transport. Since Urethane has been shown to be carcinogenic, tricaine methanesulphonate (M.S. 222) was used. Dosages of 0.5, 0.25, 0.1875 and 0.125 gms. of M.S. 222 per gallon of water were employed to transfer hybrids between Lake and Brook Trout. A concentration of 0.5 gm. per gallon proved to be lethal, whereas 0.125 gms. resulted in only mild anesthesia. The dosage of 0.25 gm. gave generally good results. About 8 minutes proved to be a satisfactory time.

(N. V. Martin and D. C. Scott: The Progressive Fish Culturist—Vol. 21, No. 4, pp. 183—184)

(iv) *Process transforms fish liver oil into stabilized dry vitamin A.*

A unique process which transforms fish-liver oil into a stabilized dry Vitamin A has been developed by a Tokyo, Japan, firm. The process involves coating minute particles of the oil with selected rigid materials so that the Vitamin A content is not destroyed by contact with the air or with other materials. The stabilized potency of the vitamin and economical prices are expected to result in great advantages to consumers, as the process is utilized in pharmaceuticals and enriching food.

(Commercial Fisheries Review, Vol. 21, No. 2, a February Supplement, 1959, page 16)

(v) *Synthetic fibers make knotless nets possible.*

Until several years ago, almost all fishing nets were made of natural fibres. Although invented in Japan in 1922, the knotless net became feasible only after rot, proof synthetic fibres were introduced into the fish net industry. The use of knotless nets in Japan is increasing. Some of the features of knotless nets are:—

1. Lighter weight and less bulk.
2. Higher strength.
3. Less resistance to currents.
4. Greater ease of handling and no friction.
5. Less labour and smaller tackle needed.
6. Less damage to the fish.
7. More exact mesh size.
8. Less adherence of dirt and microbes.

The torn parts of the knotless nets are mended as easily as are those of the knotted ones. The yarns are doubled together without twist by a doubling machine. They are redoubled and then wound on bobbin of the netting machine. After that the nets are inspected and flaws or irregular twists are repaired, the top and bottom selvedges are woven. Any parti-

cular type of net can be made to order. Heat setting is necessary for these nets so that twist of the strands are fixed in position. They may also be dyed with the commercial dyestuffs, pigment colours or coal tars in which case no setting is required.

(F.A.O. World Fisheries Abstracts, Vol. 10, No. 1, Jan.-Feb., 1959, pp. 9-10)

(vi) *Irradiation Tests.*

Significant increases in the keeping properties of fish have been achieved by subjecting them to irradiation, according to "Food Investigation", 1957, published by the British Department of Scientific and Industrial Research.

Samples of haddock, mackerel, herring, cod and sole were irradiated at Harwell in an experiment carried out by the staff of the Torry Research Station and the low temperature Research Station. Cod and sole were least affected in odour and flavour by irradiation, while Cod exposed to comparatively low doses of radiation were found to remain palatable for thirteen days, compared with 9 for untreated fish of the same kind.

The best results were obtained with fish which had been irradiated and treated with an antibiotic solution. These remained edible for 23 days when stored at freezing temperatures.

The report also contains information about experiments carried out to determine the usefulness of freezing at sea as a means of preserving fish.

(Trade News, March 1959)

(vii) *The new beheading and gutting machine.*

The new beheading and gutting machine for herring, introduced by a Norwegian firm, works on a quite new principle. There is no squeezing or flicking of the herring and the gutting is performed perfectly, nothing being left to chance. The capacity of the machine is 30 barrels of beheaded and gutted herrings/hour. The operation is semi-automatic. The herrings are placed by hand on the conveyer belt which passes them to knives and the suction wheel. The gut is sucked into the machine and ejected through a hose led over the deck. The machine is designed not only for use aboard vessels but many Norwegian fishing plants are using it ashore. Deliveries have also been made to Iceland.

(F.A.O. World Fisheries Abstracts, Vol. 10, No. 3, May|June, 1959, page 2)

(viii) *Containers and Transport cases for the fishing industry.*

The new stacking cases made of water proof birch plywood under the trade mark 'Pylfa' has been produced by a firm in Norway. The cases are joined by means of angle iron, galvanised or made of stainless steel. All parts are glued, rivetted and screwed, the cases thus being free of spikes. They are varnished from inside and outside and can easily be washed or rinsed. They are manufactured in various shapes with or without lids. Special attention is paid to the construction of insulated containers for the transport of frozen goods. They are insulated by means of styropor. These cases are light and strong.

(Norwegian Fishing News, Vol. VI, No. 3, 1959)

(ix) *Treating Salmon with Nitrite Dip for better preservation.*

Treatment of salmon with nitrite by dipping for 2 to 3 minutes in 0.2 per cent solution of the preservative showed slight improvement in the keeping quality of the iced fish. The 5 minutes dipped samples developed brownish black discolouration during 2 weeks of iced storage. The pink colour of gills disappeared more quickly than normal and there were spots of strong rancidity. After frozen storage of untreated and nitrite-dipped salmon for 7 or 8 months at—20° C, no bad effect of a 2 minute dip could be shown but the 5 minute dipped samples resulted in serious quality deterioration including discolouration and rancidity.

(Commercial Fisheries Review, January, 1959, page 23)

(x) *Chlorination to preserve quality of fish.*

Value of chlorinated sea-water in preserving the high quality of fish aboard fishing craft has been shown by a series of tests in the North Atlantic fishery, reports the U.S. Bureau of commercial fisheries. It was found that fish washed in a spray of chlorinated sea-water just after evisceration and transported in holds also washed by a similar solution were cleaner and fresher than fish coming from trawlers using only ordinary sea water. The trawler using chlorinated sea water left port at the same time, fished the same waters and returned at the same time as other fishing vessels; therefore comparisons between old and new techniques were readily made.

It is stated that the equipment is inexpensive and easily installed. It consists of a hypochlorinator metreing pump and an electric motor, the chlorinated water from this assembly can easily be introduced into the existing washdown system of the vessel. The chlorine is provided by an eight per cent solution of sodium hypochlorite which is metred into the washdown system at the rate of 50 to 80 parts per million parts of water for washing the holds and pen boards. By regulating the metering pump, a solution of 10 to 20 p.p.m. can be used in rinsing the eviscerated fish. Dealers say that from fish so handled there are no detachable odours of decomposition in the cavity of the fish, and that such fish are cleaner and fresher looking than those from other trawlers. Detailed information on the tests or the technique of using the equipment may be obtained from the regional Director Bureau of Commercial Fisheries, Massachusetts, U.S.A.

(Fisheries News letter, January, 1959, page 17)

(xi) *Automatic Machines—New Salt Ice.*

A new form of salt ice, produced by an automatic machine manufactured in U.S.A., is the subject of report by Petroleum Pipe and Steel Co. of New York, agents for the manufacture. This ice, which has been developed by Flakice Corporation is known as "sub-cooled Flakice frozen salt water or sea water ribbon ice". It can be made from sea water or by adding 1½ p.c. to 3 p.c. rock salt to potable water. The product takes the form of thin and slightly curved pieces of dry, brittle ice, 1 to 4 inches wide and long and 1/8 inch to 1/2 inch thick. The ice is prepared by continuous freezing of a film of salt water on a refrigerated drum. It peels off almost immediately at 0° F. When placed in contact with warm flesh it melts, forming an indentation into which the fishery product can form-fit. There are no sharp edges or points to bruise the fish. It is claimed

that 1 lb. of the ice will do the same refrigeration work as 1-1/3 lb. of crushed block ice.

(Fisheries Newsletter, June, 1959, page 13)

Trade

Morocco—Agar-agar industry.

By the end of 1958 only one company was producing agar-agar in Morocco, but another company formed in July, 1958 would begin production in 1959. The new company is capitalised at 10 million francs and has a board of directors made up of Morroccan, Spanish, and French citizens.

The company in 1958 produced 200 metric tons during that year and expects to expand its export to 300 tons in 1959 with the help of enlarged facilities.

Export of agar-agar in 1957 amounted to about 296,000 pounds valued at U.S. $ 351,000. The United States was the principal buyer of Moroccan agar in 1957 with 111,000 pounds valued at U.S. $ 136,100 followed by France, 40,700 pounds valued at U.S. $ 52,500; Great Britain, 36,700 lbs. valued at U.S. $ 44,100; Argentine, 33,500 pounds valued at U.S. $ 38,700; and West Germany, 27,000 pounds, valued at U.S. $ 30,700. Eight other countries took the balances of the export in 1957.

The Moroccan Government have informed exporters that gelidium algae could no longer be exported from Morocco. This, it is believed to protect the agar-agar producer by assuring a three months supply of gelidium algae before licensing any export of the raw material.

(Commercial Fisheries Review, March, 1959, page 79)

(ii) *Midget crayfish tails.*

Midget crayfish tails, which a few months ago seemed likely to depress the valuable American market for Australian crayfish have now found a satisfactory market in United States retail supermarkets. The chief veterinary officer of the Australian Department of Primary Industry, while visiting the U.S.A. recently, investigated the marketing of Australian crayfish there. He reported that while the restaurant trade preferred larger tails and offered a ready market for them—midget tails appealed to a different type of consumer. Midgets had now entered the retail supermarket trade which was formerly confined to crayfish from other countries. This was a new field for Australian product which was selling very well. Australian price top the market in the U.S.A. The U.S.A. and Hawaii buy practically the whole of Australian crayfish exports, most of which are from Western Australian waters. South Australia and Tasmania are also exporters.

(Trade News, March, 1959, p. 13)

Conservation and Management

(i) *Seine fishing in the Lofoten area prohibited.*

The Norwegian slorting passed a resolution requesting the prohibition of seine fishing in the Lofoten area, off the north-west coast of Norway during 1959 and 1960. The Lofoten Fisheries are active in the late winter and early spring when migratory cod come into the fjords to spawn. The Government proposed that seine fishing be permitted after mid-March as in the past several years. This proposal was based on recommendation from experts. The vast majority of fishermen, who customarily fish with lines and small nets, vigorously opposed seine fishing with the complaint that the seiners drove away the fish and were responsible for the poor

catches. The Minister of fisheries spoke in favour of the two-year prohibition.

The prohibition is not expected to have any significant effect on the total Lofoten catch as such gear has in the past accounted for only a small proportion of the total. Also the ban will encourage additional fishermen to take part in the fishery. If good catches are brought in during the next two years, the prohibition may be extended. It is doubtful that the ban on seines will make it possible to determine whether their use is harmful to the fish stocks.

(Commercial Fisheries Review, March, 1959, page 85)

MARINE FISHERIES RESEARCH

(i) *A study on scale character and growth rate of small fat herring from North Norway.*

From the data on age, distribution, scale character and growth increments, it can be seen that herring of the Southern type in both years have the same growth rate as those of the Northern type.

It is concluded, therefore, that the corelation, "N-Type"—slow growth—"S-type"—faster growth as revealed by an analysis of mature winter herring, is due to the dominance of fast growing "S-type" herring of Southern origin in the composite "S-type" winter herring and vice versa, a dominance of slow growing herring of northern origin the composite samples of "N-type" winter herring.

The conclusion is not incompatible with the observations made by Marty (1956), that the growth rates tend to decrease when the stock is rich and the observation of Ostvedt (1958), that a rich stock seems to be dependent on a rich influx of "N-type" herring.

Admittedly, it is a weekness pertaining to the present material that the "S-type" herring are few in the samples and it would be worthwhile investigating fat herring from the waters of More-Trondelag to see if any significant differences in growth rates of "S" and "N" types can be discerned there.

The strong dominance of the year-class 1918 as II group in 1930 shows that a rich year-class of herring under such circumstances as then prevailed, may be recognised at the early stage of II group, a point well worth noting for routine survey purposes.

(M. Soeprapto—Fiskeridirektoratets Skrifter—Vol. XII, No. 5)

(ii) *Observation on Herring Spawning and larval distribution in the Firth of Clyde in* 1958.

In the period February-April, 1958 an intensive survey was carried out on the herring spawning grounds of Ballantrae Banks, in the outer reaches of the Firth of Clyde, and over the regions of subsequent larval dispersal.

During a detailed dredge and grab survey of the bank an egg patch, measuring approximately 320 x 32 m. was located. This was confined to a gravel and small stone sub-stratum. The eggs were distributed as an almost continuous carpet, with the layers of eggs ranging from two at the boundaries of the patch to eight in its densest parts. Very few dead or unfertilized eggs were observed, but the stage of development varied through the egg layers.

Estimates of the number of eggs in the patch lay between 1.03 and 2.58 x 10 and of the number of spawners giving rise to them between 7 million and 17 million. These gave estimates for the total number of herring spawning on the bank during the season of between 30 million and 85 million.

Using these estimates of total spawning flock size, the seasonal fishing mortality rate was estimated to lie between 1 and 3%.

Estimates of total spawning stock size obtained from data collected on subsequent quantitative larval surveys over the bank were in broad agreement with those derived from the egg survey. The dispersal of larvae from the bank was rapid and wide spread, and a large proportion of the larvae were probably carried out of the clyde estuary. The dispersion differed from that in 1957, when the bulk of the larvae were retained within the Firth of Clyde, and it corresponded with the dispersion of drift bottles, liberated on Ballantrae Bank during the hatching season.

(B. B. Parrish, A. Saville, R. E. Craig, I. G. Baxter and R. Priestley—Jour, Marine Biol, Assoc. U.K. 1959, Vol. 38, pp. 445—453)

INLAND FISHERIES RESEARCH

(i) *A possible relationship between yolk size and differentiation in trout embryos.*

Myomere numbers were counted in samples of reciprocal hybrids of lake and speckled trout. The fish which developed on speckled trout yolks, which are the smaller, had a lower mean myomere number. Myomere numbers of normal lake trout, speckled trout and the Fl hybrid (lake trout egg) were compared with myomere numbers and the degree of twinning was found in speckled trout but not in the lake trout hybrid. Since this relationship is not evident in fish developed on larger yolks it is assumed that there is a certain yolk size below which it becomes limiting and prevents the formation of the normal myomere complement.

(E. T. Garside and F. E. J. Fry—Can. J. Zool., Vol. 37, 1959)

GENERAL FISHERIES NEWS

(i) *The Central Board of Fisheries.*

The first meeting of the Central Board of Fisheries was held in Krishi Bhawan, New Delhi on 29th December, 1959. Shri S. K. Patil, Minister for Food & Agriculture, Chairman of the Board, gave the inaugural address after which the meeting was conducted by Shri M. V. Krishnappa, Union Deputy Minister for Agriculture. The members of the Board include Ministers incharge of fisheries of various States, Agriculture Secretary to the Government of India, Fisheries Development Adviser, representatives of the Ministries of Finance, Commerce & Industry, Transport and Communications, Railways and Defence, and representatives of the Fisheries Cooperative Societies and the fishing industry. The Deputy Fisheries Development Adviser to the Government of India is the member-Secretary.

The functions of the Board include consideration at national level of problems connected with various aspects of fisheries research and development. It will recommend suitable measures for adoption to effect better coordination of fishery activities between the Centre, States and various other organisations. .It will also discuss ways and means for implementing the programmes of development and research on fisheries.

(ii) *Technical Assistance Programme of the F.A.O.*

Mr. S. B. Gulbadamov, a Gear Technologist from Russia has been assigned to Central Inland Fisheries Research Station for a year to conduct deep water fishing experiments in the large deep water reservoirs and train personnel. Mr. Gulbadamov has joined at this Research Station and arrangements have been made to conduct deep water fishing experiments in the large reservoirs at Mettur, Krishnarajasagar, those of the Damodar Valley Corporation and other reservoirs. The experiments will be mainly on catching of fish in deep waters of the reservoirs by specially designed nets and traps and also by electrical fishing.

(iii) *Inland Fisheries Training Course* 1959-60.

36 candidates underwent training at the Central Inland Fisheries Research Institute. They included 2 Colombo Plan trainees, one each from Thailand and Philippines, 19 Government deputees from the States of Uttar Pradesh, Assam, West Bengal, North-Eastern Frontier Agency, Rajasthan, Madhya Pradesh, Orissa, Andhra, Delhi and Bombay and 5 Government stipendiaries from the States of Assam and Manipur and 10 private candidates from different States. They underwent intensive training on culture fisheries in Orissa and also had extensive study tours to places of fishery interest all over India.

(iv) *Exploratory Fishing in the Sunderbans.*

The Research and Exploratory Fishing Vessel M.V. "Sunderbans" started preliminary charting and fishing experiments in the Sunderbans. The operations were started in December, 1959 when the cruises were made in the lower reaches of Muriganga, Saptamukhi and Thakuran. Initially an echo-sounding survey was made with a view to ascertain the bottom contours and the possibility of trawling. Even though the river bed is very uneven in many areas, satisfactory trawling grounds were found in Saptamukhi and in the neighbourhood of Frazergune island. Fishing experiments have been initiated in the area.

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